



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/694,077

10/27/2003

Dharmesh Jawarani

SC13056TP

3791

23125

7590

04/05/2005

FREESCALE SEMICONDUCTOR, INC.
LAW DEPARTMENT
7700 WEST PARMER LANE MD:TX32/PL02
AUSTIN, TX 78729

EXAMINER

GUERRERO, MARIA F

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 04/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/694,077

Applicant(s)

JAWARANI, DHARMESH

Examiner

Maria Guerrero

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 January 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 and 17-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 and 17-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☒ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

1. This Office Action is in response to the Amendment filed January 17, 2005.

Status of Claims

2. Claim 16 is canceled. Claims 1-15 and 17-31 are pending.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claim 31 is rejected under 35 U.S.C. 102(b) as being anticipated by Kittl et al. (US 6,004,871) (of record).

Kittl et al. teaches forming a polysilicon line over a semiconductor substrate, forming a liner over the polysilicon line, implanting particles having an atomic mass at least equal to that of xenon through the liner into the polysilicon line to amorphize an upper portion of the polysilicon line and forming a metal silicide with the amorphized upper portion of the polysilicon line (Abstract, Fig. 4b-4e, col. 4, lines 25-67).

4. Claim 31 is rejected under 35 U.S.C. 102(b) as being anticipated by Rodder et al. (US 6,326,289).

Rodder et al. teaches forming a polysilicon line over a semiconductor substrate, forming a liner over the polysilicon line, implanting particles having an atomic mass at least equal to that of xenon (noble gas) through the liner into the polysilicon line to amorphize an upper portion of the polysilicon line and forming a metal silicide with the

amorphize upper portion of the polysilicon line (Abstract, Fig. 1-6, col. 2, lines 50-67, col. 3, lines 25-35, col. 4, lines 15-20, 59-67, col. 5, lines 1-35).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-9, 13-15, 22, and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takasou (US 6,274,447) (cited on IDS) in view of Yu (US 6,514,829) and Choksi et al. (US 4,818,711).

Takasou shows providing a polysilicon line over a semiconductor substrate and implanting xenon into the polysilicon line to amorphize an upper portion of the polysilicon line and upper portions of the source/drain regions (Fig. 3, col. 3, lines 17-20, col. 5, lines 23-35, col. 6, lines 23-44). Takasou teaches forming a metal silicide with the amorphized upper portion of the polysilicon line and the upper portions of the source/drain regions (Fig. 4-5, col. 6, lines 63-67, col. 7, lines 1-5). Takasou discloses implanting at a dosage level 3×10^{14} atoms/cm² and the energy of about 10 KeV or 30 KeV (col. 9, lines 15-20).

Furthermore, Takasou teaches forming a metal silicide with the amorphized upper portion of the polysilicon line and the upper portions of the source/drain regions and the metal silicide including cobalt silicide and nickel silicide (col. 6, lines 63-65, col. 7, lines

Art Unit: 2822

1-5). Takasou discloses any natural oxide film or the like that is present on the surfaces (dielectric liner) of the gate electrode and source/drain regions being removed (col. 6, lines 24-27, col. 10, lines 38-41).

Takasou does not specifically show the linewidth being less than or equal to 50 nanometers and the specific dosage as claimed. However, Yu shows providing a polysilicon line being less than or equal to 50 nanometers (col. 4, lines 30-45). Yu also teaches implanting at a dosage level 2×10^{14} atoms/cm² and energy of 10 KeV (col. 5, lines 53-60).

Takasou does not specifically show implanting through the dielectric liner layer. However, Choksi et al. is cited as evidence to show that the step of forming a dielectric liner layer prior to the implantation process and implanting through the dielectric liner layer to amorphize portions of a polysilicon line is conventional in the art (Abstract, Fig. 4-6, col. 3, lines 43-50).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Takasou reference by including the linewidth and the dosage as taught by Yu and the step of implanting through the dielectric liner as suggested by Choksi et al. in order to provide a thin transistor having reduced resistance, good electrical and physical properties, and excellent uniformity (Yu, col. 4, lines 55-65; Choksi et al., col. 2, lines 20-25).

Regarding the specific ranges claimed, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to specify the range as claimed by routine experimentation because there is not evidence of criticality. "Where

Art Unit: 2822

the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990). See MPEP § 716.02 - § 716.02(g).

6. Claims 7-12, 15, 17-25, and 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai et al. (U.S. 6,010,952) (cited on IDS) in view of Yu (U.S. 6,514,829) and Choksi et al. (US 4,818,711).

Tsai et al. shows providing a polysilicon line over a semiconductor substrate and implanting xenon into the polysilicon line to amorphize an upper portion of the polysilicon line (col. 2, lines 65-67, col. 3, lines 1-15, col. 4, lines 5-7). Tsai et al. teaches implanting at a dosage level equivalent to an arsenic dosage ranging from about 1×10^{14} atoms/cm² to about 3×10^{14} atoms/cm² and the energy ranging from about 20 KeV to about 40 KeV (col. 4, lines 13-21). Furthermore, Tsai et al. discloses forming a metal silicide with the amorphized upper portion of the polysilicon line (Abstract, col. 5, lines 20-26).

Tsai et al. does not specifically show the linewidth of the polysilicon line being less than or equal to 50 nanometers. Tsai et al. does not specifically show the metal silicide including cobalt or nickel. However, Yu shows providing a polysilicon line being less than or equal to 50 nanometers (col. 4, lines 30-45). Yu teaches the metal silicide including cobalt silicide and nickel silicide (col. 4, lines 60-65). Yu also teaches

implanting at a dosage level 2×10^{14} atoms/cm² and energy of 10 KeV (col. 5, lines 53-60).

Tsai et al. does not specifically show implanting through the dielectric liner layer. However, Choksi et al. is cited as evidence to show that the step of forming a dielectric liner layer prior to the implantation process and implanting through the dielectric liner layer to amorphize portions of a polysilicon line is conventional in the art (Abstract, Fig. 4-6, col. 3, lines 43-50).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Tsai et al. reference by including the linewidth and the cobalt silicide and nickel silicide as taught by Yu and the step of implanting through the dielectric liner as suggested by Choksi et al. in order to provide a thin transistor having reduced resistance, good electrical and physical properties, and excellent uniformity (Yu, col. 4, lines 55-65; Choksi et al., col. 2, lines 20-25).

Regarding the specific ranges claimed, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to specify the range as claimed by routine experimentation because there is not evidence of criticality. "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir.1990). See MPEP § 716.02 - § 716.02(g).

Response to Arguments

7. Applicant's arguments with respect to claims 1-15 and 17-31 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 571-272-1837.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

April 1, 2005


MARIA F. GUERRERO
PRIMARY EXAMINER